ASTRONOMY AND ASTROPHYSICS

A European Journal

Volume 34 1974

Published by Springer-Verlag Berlin · Heidelberg · New York
on behalf of the Board of Directors

Astronomy and Astrophysics A European Journal

Board of Directors

Chairman: A. Blaauw (ESO)
Y. Andrillat (France)
L. Biermann (Germany)
H. G. van Bueren (The Netherlands)
H. Elsässer (Germany)
H. C. van de Hulst (The Netherlands)
R. Kippenhahn (Germany)
J. Kovalevsky (France)
G. Larsson-Leander (Sweden)
W. Priester (Germany)
A. Reiz (Denmark)
L. Rosino (Italy)
E. Schatzman (France)
G. Setti (Italy)
J. L. Steinberg (France)
U. Steinlin (Switzerland)
A. G. Velghe (Belgium)

Editors-in-Chief

J. Heidmann
Observatoire de Meudon
92190 Meudon (France)

S. R. Pottasch
Kapteyn Astronomical Institute
P. O. Box 800
Groningen 8002 (The Netherlands)

Editing Secretaries

Mrs. F. Axisa
Miss B. Perche

Mrs. C. E. Kremer

Board of Editors

K. Bahner (Heidelberg)
J. E. Baldwin (Cambridge)
B. Baschek (Heidelberg)
W. Becker (Basel)
E. J. Blum (Meudon)
K. H. Böhm (Seattle)
J. Borgman (Roden)
E. M. Burbidge (Hailsham)
G. M. Clemence (New Haven)
O. J. Eggen (Woden)
W. Fricke (Heidelberg)
V. L. Ginzburg (Moscow)
M. Hénon (Nice)
J. T. Jefferies (Honolulu)
F. D. Kahn (Manchester)
F. J. Kerr (Maryland)
K. O. Kiepenheuer (Freiburg)
H. van der Laan (Leiden)
P. Ledoux (Liège)
J. Lequeux (Meudon)
P. O. Lindblad (Stockholm)
L. Mestel (Manchester)
P. G. Mezger (Bonn)
B. Morando (Paris)
F. Pacini (Frascati)
B. E. J. Pagel (Hailsham)
L. Plaut (Groningen)
F. Praderie (Meudon)
M. S. Roberts (Green Bank)
M. Schmidt (Pasadena)
F. Spite (Meudon)
A.B.Underhill (Goddard Space Flight Center)
H. Van Regemorter (Meudon)
L. Woltjer (New York)
J. P. Zahn (Nice)
Ya. B. Zeldovich (Moscow)
C. Zwaan (Utrecht)

The exclusive copyright © for all languages and countries, including the right for photomechanical and any other reproduction, also in microform, is vested in European Southern Observatory (ESO).
The use of registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Springer-Verlag · Berlin · Heidelberg · New York
Printed in Germany
Printers: Brühlsche Universitätsdruckerei, Giessen

Volume 34 1974

Contents

Stars and Stellar Evolution

BASCHEK, B., KODAIRA, K., SCHOLZ, M.: On the Detectability of Bp-type Abundance Anomalies in Early Main-sequence Stars 1

MOFFAT, A. F. J.: The Wolf-Rayet Star HDE 311884 in the Open Cluster Hogg 15 29

MÉGESSIER, C.: The Ap Star 108 Aqr I 53

SÖDERHJELM, S.: Light-curve Synthesis and Element Determination for Eclipsing Binaries. Application to MR Cyg 59

BROGLIA, P., MARIN, F.: Y Cam: An Eclipsing System with a Delta Scuti Primary 89

GUSTAFSSON, B., KJAERGAARD, P., ANDERSEN, S.: The Metal Content and Microturbulence in G8-K3 Giants, as Investigated by Means of Photoelectric Photometry in Very Narrow Bands 99

(RN) STIFT, M. J.: The Radii of the Ap Stars 153

(RN) RAKOS, K. D.: Photoelectric Measurements of Sirius B in UBV and Strömgren System 157

(RN) CHANMUGAM, G.: Pulsing X-ray Sources as Jacobi Ellipsoids 159

(LE) PACZYŃSKI, B.: Mass of Cygnus X-1 161

CIATTI, F., D'ODORICO, S., MAMMANO, A.: Properties and Evolution of BQ[] Stars 181

LESH, J. R., AIZENMAN, M. L.: The Pulsation Properties of the β Cephei Stars 203

SACKMANN, I.-J.: The Effects of Changes in the Opacity on Main-sequence and Evolved Models 241

HEARNSHAW, J. B.: Carbon and Iron Abundances for Thirty F and G Type Stars 263

VAN GENDEREN, A. M.: On the Amplitudes of Population I Cepheids in the Galaxy and M 31 279

(RN) RAKOS, K. D.: The Light Variation of the Ap Star HD 25823 297

(RN) PETERSEN, J. O.: Effects upon Period Ratios of Cepheid Models from Artificial Changes in Opacity and Mean Molecular Weight 309

(RN) VREUX, J. M., ANDRILLAT, Y.: Spectrographic Observations of Of Stars in Carinae 313

(RN) WACHMANN, A. A.: UBV Photometry and Orbital Elements of V 453 Cygni 317

(RN) JANOT-PACHECO, E.: On the Cepheid Nature of π PsA 325

(LE) SWINGS, J. P.: Similarities in the Spectra of Three Southern Peculiar Emission Line Stars with Infrared Excess: HD 45677, HD 87643 and GG Carinae (HD 94878) 333

CHIOSI, C., NASI, E.: Mass Loss from Early Type Stars 355

ELVIUS, A.: Polarization of Light from the Peculiar Be Star MWC 349 371

CANNON, C. J.: The Inversion of Emission Line Spectra from Wolf-Rayet Stars 387

CONTI, P. S., HENSBERGE, G., VAN DEN HEUVEL, E. P. J., STICKLAND, D. J.: A Study of the Blue Stragglers in Praesepe, M 7 and the Hyades Cluster 393

MAEDER, A.: Analytical Studies in Stellar Evolution II: On the Evolution of Rotating Stars in the $\log T_e - \log \varrho_e$ Plane from Main Sequence to Pre-supernova Stage 409

FRIEDJUNG, M.: A Test for the Existence of Dust in Supernova Envelopes 419

(RN) GABRIEL, M., NOËLS, A.: Influence of the Variation of the Convective Zone Boundaries on the Secular Stability of Stars 455

(RN) DE VEGT, CH.: On the Angular Diameter of TX Piscium from Lunar Occultations 457

(RN) TRIMBLE, V.: Spectroscopic Binaries and Collapsed Stars. II. Systems with Small Mass Functions 461

Galactic Structure, Stellar Dynamics, Interstellar Matter

BOESGAARD, A. M.: The Abundance of Interstellar Beryllium 9

LOUISE, R.: Morphological Study of the Planetary Nebula NGC 7662 21

WORDEN, S. P., GRASDALEN, G. L.: A Digital Analysis of the Polarization within the Serpens Nebula 37

BURTON, W.B., BANIA, T.M.: On the Interpretation of the Kinematics of the Local Interstellar Neutral Hydrogen as Indicative of a Separate Subsystem 75
DOWNES, D., WILSON, T.L.: Radio Recombination Lines in the Direction of Supernova Remnants 133
BUSSOLETTI, E., EPCHTEIN, N., BALUTEAU, J.P.: A Calculation of Infrared Spectra from Dust in Planetary Nebulae 141
(RN) GLIESE, W.: The Low-velocity Red Dwarfs in the Vicinity of the North Galactic Pole 147
(LE) SCHLICKEISER, R., THIELHEIM, K.O.: Celestial Distribution of Galactic Gamma Radiation 167
BERKHUIJSEN, E.M., WIELEBINSKI, R.: A Radio Continuum Survey of M 31 at 2695 MHz. I. Observations; Comparison of Radio Continuum Data 173
DEKKER, E.: On the Rate of Growth of Density Waves in Flat Galaxies 255
MOFFAT, A.F.J., FITZGERALD, M.P.: Distant Galactic Structure in Puppis: the Ruprecht 44 Aggregate 291
(RN) LUNEL, M., BERGEAT, J., SIBILLE, F., LORTET-ZUCKERMAN, M.C.: Infrared Sources in Sharpless 157 299
(RN) ZIMMERMANN, H.-U.: Measurements of the Crab Nebula and the Pulsar NP 0532 in the Hard X-ray Region 305
(LE) PAULS, T., MEZGER, P.G., CHURCHWELL, E.: Recombination Line Emission from an H II Region Surrounding the Nucleus of the Galaxy 327
(LE) BEETZ, M., ELSÄSSER, H., WEINBERGER, R.: The H II Region W 3 in the Near Infrared 335
GOUDIS, C., MEABURN, J.: The Structure of the Complex H II Region IC 1318 437
(RN) BAARS, J.W.M.: Radio Sources and the Aquila Stellar Ring. Comment on a Paper by J. Isserstedt 459
(RN) DEHARVENG, L., MAUCHERAT, M.: Observations of the Shell Nebula NGC 3199 465
(LE) ELLIOTT, K.H., MEABURN, J.: The Close Association of Paraformaldehyde Emission with Major Ionization Fronts in M 42 473

Galaxies, Cosmology

BALKOWSKI, C., BOTTINELLI, L., CHAMARAUX, P., GOUGUENHEIM, L., HEIDMANN, J.: Neutral Hydrogen Study of Spiral and Irregular Dwarf Galaxies 43
KIPPENHAHN, R., PERRY, J.J., RÖSER, H.-J.: Radiative Acceleration in the Neighbourhood of Quasi Stellar Objects 211
CROVISIER, J., LE SQUÉREN, A.M.: 4850-MHz Observations of a Sample of Radio Sources Identified with Quasars 285
(RN) DANZIGER, I.J., SCHUSTER, H.E.: The Interacting Galaxy System NGC 646 301
HÖGBOM, J.A., CARLSSON, I.: Observations of the Structure and Polarization of Intense Extragalactic Radio Sources at 1415 MHz 341
HILL, J.K.: Interaction of Metagalactic X–UV Radiation with Galactic Hydrogen 431
BURKE, J.A., HARTWICK, F.D.A.: Excess Redshifts in Groups of Galaxies 445

The Sun

WÖHL, H.: On the Solar Boron Abundance 41
JORDAN, C.: The Measurement of Electron Densities from Beryllium-like Ion Line Ratios 69
KAUFMANN, P., MARQUES DOS SANTOS, P.: Time Development of Circular Polarization Solar Microwave Bursts 197
LOULERGUE, M., NUSSBAUMER, H.: The Chromosphere-corona Transition Region as Seen in C III 225
EDDY, J.A.: A Nineteenth-century Coronal Transient 235
GOUTTEBROZE, P., LEMAIRE, P.: A Center-to-limb Analysis of Solar Mg II Lines 375
JAKIMIEC, J., JAKIMIEC, M.: Short-period Oscillations in the Solar X-ray Radiation 415

Physical Processes and Astrophysical Plasmas

DE FELICE, F.: Repulsive Phenomena and Energy Emission in the Field of a Naked Singularity 15
REINHARDT, M., ROSENBLUM, A.: A New Primary Dynamo Mechanism 23
HEISE, H.: Experimental Oscillator Strengths for Ni I and Ni II Lines 275
VON SPECHT, J.: A New Plasma-oven of Astrophysical Interest. Application to the Measurement of Ar–I Transition Probabilities 363
SCUFLAIRE, R.: Space Oscillations of Stellar Non Radial Eigen-functions 449

(RN) Stewart, P.: Strong Wave Propagation in a Magnetized Plasma 463
(LE) Kozlovsky, B., Ramaty, R.: Li Production in $\alpha\alpha$ Reactions 477
(LE) Rydbeck, O. E. H., Elldér, J., Irvine, W. M., Sume, A., Hjalmarson, Å.: Radio Astronomical Determination of Ground State Transition Frequencies of CH 479

Planetary System

Combes, M., Encrenaz, Th., Vapillon, L., Zéau, Y., Lesqueren, C.: Confirmation of the Identification of C_2H_2 and C_2H_6 in the Jovian Atmosphere 33
Pauliny-Toth, I. I. K., Witzel, A., Gorgolewski, S.: The Brightness Temperatures of Ganymede and Callisto at 2.8 cm Wavelength 129
(LE) Biraud, F., Bourgois, G., Crovisier, J., Fillit, R., Gérard, E., Kazès, I.: OH Observation of Comet Kohoutek (1973f) at 18 cm Wavelength 163
Keller, H. U., Lillie, C. F.: The Scale Length of OH and the Production Rates of H and OH in Comet Bennett (1970 II) 187

Celestial Mechanics and Astrometry

(RN) Colin, J., Grudler, P., Oblak, E.: Observations of Saturn with the Danjon Astrolabe of the Besançon Observatory during the Winter 1971–72 453

Instruments and Data Processing

Wood, H. J., Albrecht, R.: The ESO Three-channel Spectrum Scanner 81
(RN) Cole, T. W., Ables, J. G.: An Electro-optical Spectrograph for Weak Signals 149
Vidal, J.-L.: A Two Beam Single Photomultiplier Nebular Photometer 401
Andersen, J., Clausen, J. V.: Adjustment and Testing of Schmidt Telescopes 423
(RN) Borgman, J., de Vries, M.: On the Reduction of Infrared Background Radiation in Conventional Cassegrain Telescopes 471

Abstracts of Articles which will be Published in A. A. Suppl. 17

Weaver, H., Williams, D. R. W.: The Berkeley Low-latitude Survey of Neutral Hydrogen. Part II. Contour Maps 171
Weaver, H., Williams, D. R. W.: The Berkeley Low-latitude Survey of Neutral Hydrogen. Part III. An Extension to Latitude $\pm$ 30°; Profiles and Contour Maps 171

Abstracts of Articles which will be Published in A. A. Suppl. 18, No. 1

Fourcade, C. R., Laborde, J. R., Arias, J. C.: The Globular Cluster IC. 4499 339
Alcaino, G.: Photometry on the Bright Stars of the Globular Clusters NGC 5286 and NGC 6101 339
Moffat, A. F. J., FitzGerald, M. P.: NGC 2453, a Moderately Young Open Cluster in Puppis 339
Schaltenbrand, R. A.: Three-colour Photometry of SA 94 in the RGU System 339
Bohannan, B., Epps, H. W.: Hα Emission-line Stars in the Large Magellanic Cloud. I. A New Deep Survey 339
Peytremann, E.: Line Blanketing and Model Stellar Atmospheres. III. Tables of Models and Broad-band Colors 339
Noël, F., Czuia, K., Guerra, P.: First Astrolabe Catalogue of Santiago 340
Fanti, C., Fanti, R., Ficarra, A., Padrielli, L.: The B2 Catalogue of Radio Sources – Fourth Part 340
Fawcett, B. C., Henrichs, H. F.: An Extended Analysis of Fe V Spectra and Additional Identifications of Fe VI 340

(Indexed in Current Contents)

Author-Index

Ables, J. G. 149
Aizenman, M. L. 203
Albrecht, R. 81
Alcaino, G. 339
Andersen, J. 423
Andersen, S. 99
Andrillat, Y. 313
Arias, J. C. 339

Baars, J. W. M. 459
Balkowski, C. 43
Baluteau, J. P. 141
Bania, T. M. 75
Baschek, B. 1
Beetz, M. 335
Bergeat, J. 299
Berkhuijsen, E. M. 173
Biraud, F. 163
Boesgaard, A. M. 9
Bohannan, B. 339
Borgman, J. 471
Bottinelli, L. 43
Bourgois, G. 163
Broglia, P. 89
Burke, J. A. 445
Burton, W. B. 75
Bussoletti, E. 141

Cam, Y. 89
Cannon, C. J. 387
Carlsson, I. 341
Chamaraux, P. 43
Chanmugam, G. 159
Chiosi, C. 355
Churchwell, E. 327
Ciatti, F. 181
Clausen, J. V. 423
Cole, T. W. 149
Colin, J. 453
Combes, M. 33
Conti, P. S. 393
Crovisier, J. 163, 285
Czuia, K. 340

Danziger, I. J. 301
de Felice, F. 15
Deharveng, L. 465
Dekker, E. 255
de Vegt, Ch. 457
de Vries, M. 471
D'Odorico, S. 181
Downes, D. 133

Eddy, J. A. 235
Elldér, J. 479
Elliott, K. H. 473
Elsässer, H. 335
Elvius, A. 371
Encrenaz, Th. 33
Epchtein, N. 141
Epps, H. W. 339

Fanti, C. 340
Fanti, R. 340
Fawcett, B. C. 340
Ficarra, A. 340
Fillit, R. 163
Fitz Gerald, M. P. 291, 339
Fourcade, C. R. 339
Friedjung, M. 419

Gabriel, M. 455
Gérard, E. 163
Gliese, W. 147
Gorgolewski, S. 129
Goudis, C. 437
Gouguenheim, L. 43
Gouttebroze, P. 375
Grasdalen, G. L. 37
Grudler, P. 453
Guerra, P. 340
Gustafsson, B. 99

Hartwick, F. D. A. 445
Hearnshaw, J. B. 263
Heidmann, J. 43
Heise, H. 275
Henrichs, H. F. 340
Hensgerbe, G. 393
Hill, J. K. 431
Hjalmarson, A. 479
Högbom, J. A. 341

Irvine, W. M. 479

Jakimiec, J. 415
Jakimiec, M. 415
Janot-Pacheco, E. 325
Jordan, C. 69

Kaufmann, P. 197
Kazès, I. 163
Keller, H. U. 187
Kippenhahn, R. 211
Kjaergaard, P. 99
Kodaira, K. 1
Kozlovsky, B. 477

Laborde, J. R. 339
Lemaire, P. 375
Lesh, J. R. 203
Le Squéren, A. M. 285
Lesqueren, C. 33
Lillie, C. F. 187
Lortet-Zuckerman, M. C. 299
Louise, R. 21
Loulergue, M. 225
Lunel, M. 299

Maeder, A. 409
Mammano, A. 181
Marin, F. 89
Marques dos Santos, P. 197
Maucherat, M. 465
Meaburn, J. 437, 473
Mégessier, C. 53
Mezger, P. G. 327
Moffat, A. F. J. 29, 291, 339

Nasi, E. 355
Noël, F. 340
Noëls, A. 455
Nussbaumer, H. 225

Oblak, E. 453

Paczyński, B. 161
Padrielli, L. 340
Pauliny-Toth, I. I. K. 129
Pauls, T. 327
Perry, J. J. 211
Petersen, J. O. 309
Peytremann, E. 339

Rakos, K. D. 157, 297
Ramaty, R. 477
Reinhardt, M. 23
Rosenblum, A. 23
Röser, H.-J. 211
Rydbeck, O. E. H. 479

Sackmann, I.-J. 241
Schaltenbrand, R. A. 339
Schlickeiser, R. 167
Scholz, M. 1
Schuster, H. E. 301
Scuflaire, R. 449
Sibille, F. 299
Söderhjelm, S. 59
Stewart, P. 463
Stickland, D. J. 393
Stift, M. J. 153
Sume, A. 479
Swings, J. P. 333

Thielheim, K. O. 167
Trimble, V. 461

van den Heuvel, E. P. J. 393
van Genderen, A. M. 279
Vapillon, L. 33
Vidal, J.-L. 401
von Specht, J. 363
Vreux, J. M. 313

Wachmann, A. A. 317
Weaver, H. 171
Weinberger, R. 335
Wielebinski, R. 173
Williams, D. R. W. 171
Wilson, T. L. 133
Witzel, A. 129
Wöhl, H. 41
Wood, H. J. 81
Worden, S. P. 37

Zéau, Y. 33
Zimmermann, H.-U. 305